

HIMALAYAN NATURE-BASED TOURISM. POTENTIAL, REGIONAL DIVERSITY, NATURE CONSERVATION AND TOURISTIC LOAD

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Abstract

Mountains are popular sites for tourism and annually, multitudes of hikers, trekkers, and climbers converge on these areas. The Himalayas, a delicate ecosystem is being invaded by increasing levels of tourism activity. As a consequence of the increase in tourism, the pressure on naturally fragile ecosystems is growing and can lead to a serious conflict between the vulnerable environment and bringing changes to the tourism industry. That is why more and more Protected Areas (PAs) within the Himalayas have been designated. Currently, in the Himalayas there are 34 national parks and 92 areas under other protection. Overall, the entire range (547,960km²) contains over 79,008km² of PAs that account for almost 14.5% of the landmass, and almost reach the Aichi Target 11 benchmark of 17%. The Bhutanese Himalayas are unrivalled and almost 43% of the country is protected. Arunachal Himalayas are the smallest PA – just almost 5%. Overall, due to the low level of economic development in the Himalayan countries, there is currently no possibility of realizing a comprehensive, rational and balanced approach to nature protection and tourism in the region. There are ongoing attempts to selectively preserve areas characterised by primary nature and rare flora and fauna, and balance pro-poor development objectives with conservation goals. Through mapping and calculating the areas under conservation this paper flags improvements necessary to reach Aichi Targets. Thus, this paper also describes the spatial and temporal development of protected areas in the whole Himalayan range. This research showed that 79% of all PAs, that is 78 PAs, was established in the years 1970-1999. The listing process peaked in the years 1985-1994, a decade in which 30.879km² were designated, accounting for almost 39% of the total PAs in the Himalayas. However, the trend has slowed in recent years. Sensing an increasingly vulnerable resource-base, more protected areas should be designated in the near future in line with the Convention of Biodiversity's Aichi Targets. This paper is the first part of a comprehensive study about Himalayan PAs.

Keywords: Nature-based tourism; Protected areas development; Mapping; Mountains; Himalaya

Introduction

The Himalayas are a very heterogeneous physio-geographical landscape. They are mostly marked by contrast (e.g. ecological differences, changes in land relief), record landmarks (it has

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ten of the world's 14 'eight-thousanders' and 100 summits of over 7,200m), and diversity in the natural environment (e.g. vegetation and ecosystems) [1–5]. Each year, millions of hikers, trekkers, and climbers (defined as mountaineers) visit their high-mountain areas [4] the high Himalayan environment, until recently cut off from civilisation and sensitive to outside influences, has thus been abruptly exposed to them [6–9].

Due to the low level of economic development of most Himalayan countries (India, Nepal, Bhutan, Pakistan), except for China, which has an extensive economy, there is currently no possibility of introducing a comprehensive, rational, and balanced approach to the natural environment in the region. However, there are ongoing attempts to selectively preserve areas characterised by primary nature and rare flora and fauna and different priorities for multi-purpose Protected Areas (PAs).

In recent decades, each of the Himalayan countries has delineated a variety of areas with natural protection status. Among the forms of protection, national parks definitely dominate, although the conservation model is often highly pressured by commercial demands. This pressure is generally dependent on the level of economic development of a country.

In each of the above-mentioned countries, the mountain protection system has its own characteristics resulting both from economic and logistical reasons, as well as from tradition, religion, culture and mentality [10,11]. Thus, the challenges experienced by national protection systems are peculiar and have specific features.

The authors conducted a comprehensive study consisting of two stages – presented as separate papers. In the first stage (first paper: *Himalayan nature-based tourism. Potential, regional diversity, nature conservation and touristic load*), the area of the entire Himalayan region was subjected to a physical and geographical analysis aimed at showing the natural potential of the development of high-mountain tourism in the region. An inventory of the entire area was also carried out in terms of environmental protection (presence of PAs) and tourist pressure. Considerable research exists on conservation and nature-based tourism in the Himalayas, but it is fragmented by geo-political or socio-cultural boundaries. To the best of our knowledge, this is one of the first attempts to holistically take stock of the macro-trends across this region that is a global barometer for mountain tourism”.

The second stage (in a future study) focused on identifying and analysing the problems accompanying (resulting from) the development of high-mountain tourism in the Himalayan region in relation to both environmental and socio-economic issues related to them. The results of the second stage of research are presented in the next article: *Himalayan nature-based tourism: Challenges for tourism and protected areas*.

Overall, the material of this paper follows the principle of ‘from general to detail’ and consists of four basic parts. The first part outlines the physio-geographical background of the Himalayan Mountain system while demonstrating its diversity. In other words, the natural environment of the region has been characterised. The following parts of the study show spatial and temporal development of PAs in the whole Himalayan range which is increasingly exposed to the influence of mountain tourism as well as an increase of touristic pressure on particular areas of that mountain region.

Material and methods

The source criticism and spatial-temporal analysis were used as the basic method in this paper. The two key points are i) meta-analysis and ii) holistic view of the Himalayas. Generally, the article is based on an extensive analysis of the literature on the issues discussed in it, such as: physical and geographical features (geological, tectonic, geomorphological, climatic, biotic, landscape etc.) of the Himalayan mountain system, its spatial natural diversity, the importance of natural values for the development of tourism, especially high mountain, the current state of nature protection in this region and the tourist pressure on the natural environment within the entire area and its individual parts. Overall, several hundred literature items and government websites containing figures on tourism in individual Himalayan countries (and regions) were analysed.

Based on the numerous dispersed data sources the size of PAs has been calculated. With a compilation of diverse spatial and temporal data concerning to the development of PAs in the Himalayan range, we were able to show its development from the time when the first PA has been introduced till the current time. The spatial analysis was very helpful in question research which part of the range (and country) need to improve. In turn, the time analysis showed dynamics of changes in the amount and area of PAS over time. This might be a good source of knowledge for historical studies of the problem in the future.

Information was obtained from various sources, both published and governmental, has been compiled statistically and cartographically and presented in the form of tables and maps. PAs were mapped as they existed at the beginning of 2020. PAs shape files were downloaded from the 2020 World Database on Protected Planet [10] and then corrected and/or completed.

The data obtained on the basis of the above-mentioned sources made it possible to carry out an inventory of PAs in the Himalayan region and its sub regions and to determine the tourist burden of the entire Himalayas and their individual parts in specific numbers. This research has some limitations. The main one is statistical data. The lack of availability of statistical data is very common in the Himalayas. In some cases, the data exists; however, only governments have access to it, and there is no public access [11,12]. That is why, in a few cases the most recent data was not available. In others, there were 'insurmountable' difficulties in obtaining information. The authors did not use data for which they could not confirm reliability.

It should be emphasized, however, that the lack of the most recent or not very important data in a few cases does not in any way affect the overall picture that was possible to create based on the available data. Furthermore, it should be also enhanced that in the overall aspect, this information is a novelty. They are important both in terms of highlighting the scale of the described phenomena, their regional differentiation, and in terms of creating the basis for further research and reflection on the issue of increasing mountain tourism and its effects in the Himalayas.

The physio-geographical and ecological background of the Himalayas

Himalayas: General review

The Himalayas (Sanskrit: Deana-gari) form the highest mountain system on Earth. They are located between the Tibetan Plateau and the Indus, Ganges and Brahmaputra Lowlands and separate the two subcontinents – South Asian (Hindustan) and Central Asian. The Himalayas are an important orographic, climate, landscape and ecological frontier, separating two geographical worlds from each other – lifted to the height of the endless cold mountain wastes of Tibet from the hot humid, vibrant, landscapes of the Ganges lowlands and the plains of Assam [1,13].

By creating an orographic barrier to the cool air masses from the north, the Himalayas cause South Asia, especially Hindustan, to have a warmer climate than other areas in the same latitudes [1,14]. In turn, by not 'letting in' the warm and humid air of the southeast monsoon, the Himalayas significantly contribute to the creation of desert areas in Central Asia. Forcing moist air masses to rise and causing some of the highest precipitation rates on Earth, the Himalayas are also 'responsible' for heavy rains on their southern fringes and creating specific landscapes with excess moisture [15].

On a global scale, the Himalayan environment is characterised by the largest ecological contrasts. There is huge topographic prominence, varied insolation and contrasts in north-south exposures of slopes [16]. The masses of warm summer oceanic monsoon, as well as dry icy anticyclone, are blocked, which paralyses Central Asia in winter. It is a land not only of contrasts, but also records. As many as ten out of the 14 eight-thousanders in the world are located in the Himalayas. One hundred Himalayan peaks reach a height of over 7,200 metres and mountain passes here have an average altitude of 5,000 metres.

Within this mountainous system exists unprecedented landscape diversity resulting from a strong fragmentation into longitudinal mountain zones and ridges, transverse valleys and gorges, separate massifs and extensive valleys. Vertical sections of the Himalayas contain the

most complete spectrum of climate and vegetation zones on Earth – from tropical rainforests, with extremely rich biodiversity, to ice-capped and lifeless mountain peaks and valleys.

The Himalayas are a geographical land with very clear boundaries set by nature. In the north, these are the deeply indented, longitudinal valleys of the Indus and Tsangpo separating the Himalayas from the Tibetan Plateau, its marginal Trans-Himalayan Range. In the south – the mountain edge, a suture separating the mountains from the alluvial valleys of the Indus and Ganges. And in the northwest and east – the precipitous gorges of the Indus and Brahmaputra valleys. In the west, the Indus Valley separates the Himalayas from the high mountain ranges of Ladakh and Karakorum, and the deep canyon of Tsangpo-Brahmaputra – in the east – from the Sino-Tibetan Mountains [1,4,7].

The Himalayas are an area inhabited by diverse tribes and nationalities, strongly united with each other by two great world religions – Hinduism and Buddhism. They operate, which is rare, on a complementary rather than a split basis. This is an extremely interesting region in terms of ethnicity and culture. It is a space with the highest (next to the Holy Land) ‘spiritual intensity’, the land of myths and the seat of the mystical Shangri-La – the heavenly land of happiness and peace.

Regions

The Himalayas stretch almost latitudinally from northwest to southeast, and further east over a length of about 2,400km. The width of this mountain system ranges from 350km in the western part (Kashmir) to 150km in the east (Arunachal Pradesh) (Fig. 1). The range has the shape of a gentle arch, open to the north-east. In the north, the valleys of the upper Indus and the Brahmaputra separate the Himalayas from the Trans-Himalayas, which are on the edge of the Tibetan Plateau [1]. The area of the Himalayas is about 550,000km² [3]. The Himalayan Mountain system forms a separate physio-geographical land (unit). It neighbours such lands and natural regions as: the Tibetan Highlands in the north, the Burmese Mountains in the east, the Hindustan Plain in the south, the Kashmir Valley and the Hindu-Kush range in the west [1,3].

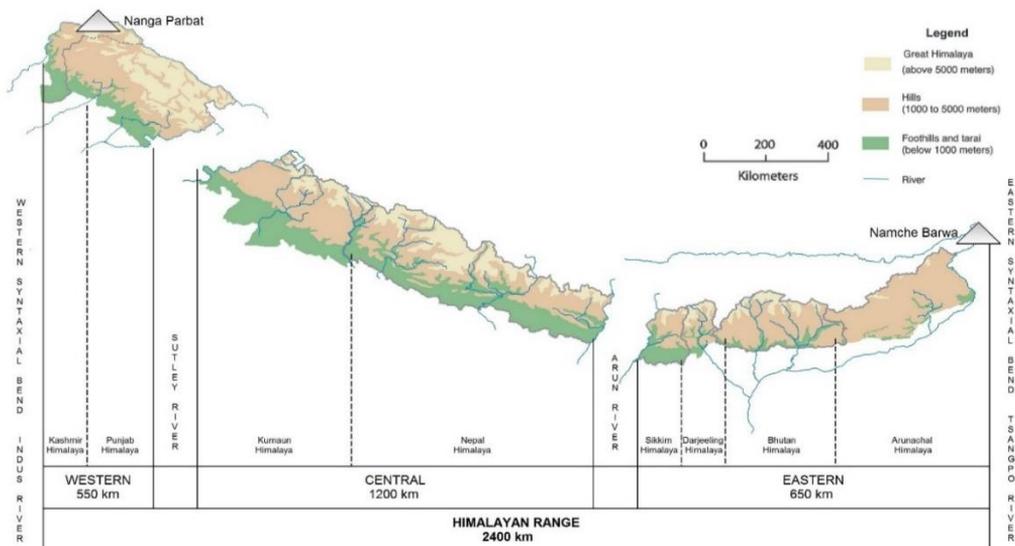


Fig. 1. Division of the Himalayas on to basic geographical regions [3].

The internal diversity of the Himalayas, as in the case of most mountain areas, depends on the geological structure, the sculpture that reflects it and the climate contrasts it generates. Like all mountains, especially the younger ones, the Himalayas are characterised by a longitudinal banded arrangement of tectonic zones, referring to the main stages of orogenesis. Tectonic zones correspond to specific rock formations, transformed to varying degrees as a result of overlap, folding, metamorphism, etc.

Tectonics and lithological diversity of individual ranges directly translate into hypsometry and relief of tectonic and geological zones in the Himalayas. Taking into account the ground (tectonic-geological-geomorphological) criterion, the following units of the highest taxonomic rank are distinguished in the physio-geographical spatial structure of the Himalayan Mountain: Siwalik Mountains (sub-Himalayas), Small (central, inner, central) Himalayas (Himachal) and the Great (high) Himalayas (Himadri).

These units make up the three-band system of the Himalayan arch throughout its range, which is why they can be considered the most important (first degree) regional units. The role of another primary (next to the soil characteristics) regionalisation factor – climate – consists of a gradual increase in precipitation from west to east and a reduction in seasonal thermal differences, which results in a gradual transition in the climate from subtropical through tropical to equatorial. In this respect, the Himalayas are divided into North-Western (Punjab), Central (sometimes called Nepalese) and Eastern. The division of the Himalayas into Western (North-Western), Central and Eastern also has a geomorphological justification and manifests itself in the different nature of river gorges within them, the gradual decrease in the width of the Himalayan arch, the narrowing of the tectonic-geomorphological zones, their partial hatching, the changing heights of the peaks and so on.

Units of the second, lower taxonomic order in the physio-geographical division of the Himalayas refer to the transition zones between the main ranges and to mountain sub-regions (chains and groups). They are separated from each other by deep, transverse river valleys, cutting from the north to the south in the ranges of the Small Himalayas and Siwalik. Individual parts of the Himalayan arch have their own geographical names. These names, or the regions corresponding to them, do not always have a comprehensive physical and geographical justification, but in general they are quite well divided into the division of the Himalayas from west to east. They are in the North-western (Punjab) Himalayas: Ladakh, the Kashmir Himalayas, Zaskar, Lahaul and Spiti, the Kinnaur Himalayas; in the Central Himalayas: Kumonian and Nepalese Himalayas; in the Eastern Himalayas: Sikkim, Bhutanese and Assami Himalayas. The Himalayas are divided between five countries: India, China, Pakistan, Nepal and Bhutan. However, most of the range is located within India, Nepal and Bhutan.

The Himalayan population is divided into five nationalities (Indians, Nepalese, Bhutanese, Pakistanis and Chinese) and comes from four distinct ethnic groups, that is, Indic people, Tibetan people, Afghan-Iranian people and Burman/South-east Asian people. The Himalayan population belongs to four distinct cultural groups, which throughout history have systematically penetrated the isolated indigenous Himalayan population. Those migrating cultures – Hindu (Indian), Buddhist (Tibetan), Islamic (Afghan-Iranian) and Animist (Burmese and south-eastern Asian) – without any doubt have created their own individual and unique place. Their current arrangement, though with a few exceptions, is linked to specific geographical regions, and the relative altitudes at which they occur [1,3].

Himalayan ecosystems

Each of the regions mentioned has its own spectrum of landscapes and vegetation zones referring to individual climatic zones (Fig. 2). The richest biomes occur in parts of the Eastern Himalayas [2,17]. According to the World Wildlife Fund, there are over 4,000 vascular plant species on 10,000km². About 30% of forest plants are exclusively Himalayan species (oaks, rhododendrons, pines). In the Eastern Himalayas alone over 10,000 species of plants, around 300 species of mammals, 176 of reptiles, 105 of amphibians and 269 species of freshwater fish have been described to date. In the last ten years, the number of newly discovered species has exceeded 300 [18]. The number of new species not yet documented seems sure to grow.

If the main natural asset of the eastern parts of the Himalayas is exceptional biodiversity, especially botanical, then in the case of the north-western part of the Indian Himalayas (Punjab Himalayas), fauna is a special value – rare animals, primarily mammals, inhabiting the higher (over 2,000m above sea level) parts of the mountains. If, in the North-Western Himalayas the biogeographic background consists of palearctic species, then in the Eastern Himalayas – tropical. If the botanical showcase of the North-Western Himalayas is coniferous forests: pine, cedar,

spruce and juniper, then in the Eastern Himalayas – evergreen tropical forests with bamboo, and in the higher parts of the mountains – with magnolias and rhododendrons [2,17,19,20].

metres AMSL	Western Himalaya (Punjab Himalaya)	Central Himalaya (Garhwal Himalaya)	Eastern Himalaya	
			Sikkim Himalaya	Arunachal Himalaya
5000	Nival level	Nival level 5000	Nival level	Nival level
4500	Snow line 4400	Snow line 4500	Snow line 4900	Snow line 4900
4000	Alpine level alpine meadows and shrubs 4200	Alpine level alpine meadows and shrubs 3900	Alpine level alpine meadows and shrubs 4200	Alpine level alpine meadows and shrubs 4200
3500	Subalpine forest 3600	Subalpine forest 3700	Subalpine forest 3900	Subalpine forest 3900
3000	Birch forest 3400	Birch and rhododendron forest 3500	Coniferous-rhododendron forest (Abies densa, A. delavayi, Tsuga dumosa, Taxus baccata, Pinus excelsa)	Coniferous-rhododendron forest (Abies delavayi, Tsuga dumosa, Taxus baccata)
3000	Wet coniferous forest (Abies Webbiana, Betula) 3000	Wet coniferous-oak forests	3000	3000
3000	Wet mixed forest (Picea morinda, Quercus incana, Qu. dilatata, Abies Webbiana, Cedrus deodara, Acer, Quercus ilec) 2000	(Quercus semicarpifolia, Picea morinda, Abies Pinow, Quercus dilatata, Qu. incana, Qu. jlix) 2000	Tropical evergreen alpine forest (Quercus lamellosa, Acer Nocker, Rhododendron arboreum, Hydrangea, Bambus)	Tropical evergreen alpine forest (Quercus, Acer, Castanopsis, Rhododendron arboreum, Magnolia campbell)
2000	Pine forest with an evergreen understorey (Pinus Roxburghii, P. longifolia) 1000	Pine forest (Pinus Roxburghii, P. longifolia) 1600	Lower limit of night frosts 1800	2000
1500	Sclerophyll (Olea cuspidata, Dodonea viscosa, Punica, Oleander) 600	Sub-tropical deciduous forest (Shorea robusta, Terminalia paniculata, Anogeissus, Schima wallichii, Dalbergia sissoo)	Tropical evergreen low mountain forest (Quercus lanata, Qu. Lamellosa, Castanopsis tribuloides, C. Indica, Phoebe, Cyatheaceen, Aesculus indica) 1000	Tropical evergreen low mountain forest (Quercus dilatata, Qu. Pachypull, Castanopsis zeylanicum, C. indica, Michelia, excelsa, Nyssa, Phoebe) 1100
500	Subtropical open deciduous forest with scrub (Acacia modesta, Nerium oleander, Zizyphus)		Tropical deciduous forest (Shorea robusta, Terminalia paniculata, T. tomentosa, Albizzia siliquata, Musa, Dendroaia caelamus, Namistoniil, Pandanus, Nipa Fruticosa)	Tropical deciduous forest (Cinnamomum zeylanicum, Phoebe, Boilsmedia, Pandanus)

Fig. 2. Altitudinal zones of the Himalayas [2].

Unfortunately, due to anthropogenic impacts, especially within the lower floors of the mountains (cutting down mountain forests for tea plantations, teak trees, for fuel, etc.), many species of plants and animals are threatened with extinction [17,20]. According to data from the Centre for Applied Biodiversity Sciences of the international organisation Conservation International [19], 3,160 endemic plant species, eight endemic bird species, four mammals and four amphibians are at risk in the Himalayas. Other sources cite far greater numbers of endangered species, citing the destruction of mountain forests, which are a shelter and home to most species of Himalayan animals. Due to the aforementioned threats, this area of the Himalayas has been classified by the organisation in the Hotspot Regions of the World list, i.e., 20 regions of the world very valuable in nature, with progressive environmental degradation and disappearing biodiversity. This threat to such a large number of plants is also unfortunate for pharmaceutical

reasons, since Himalayan forests and meadows are the source of over 600 species of medicinal plants, used for thousands of years in the so-called ethnomedicine, i.e., folk medicine [2].

Protected areas of the Himalayas

Conservation of the Himalayas

Conservation of Himalayan natural resources, ecology, and environment (described in Section 3) is one of the major issues facing the nations which have them under their own jurisdiction. It is well known that by conserving various natural resources it is possible to stop further degradation of the land. However, it is not that easy in developing countries. A population explosion in the Himalayan range and consequent pressure on natural resources have taken their toll in the whole mountain region, leading to overexploitation of resources. In the fifty-year period from 1961 to 2011, the Himalaya population grew by 250%, from 19 to 53 million and the highest population density, which has approached 1,000 people per square kilometre (923.57) was recorded in the Darjeeling Himalayas [3].

All areas, including the inaccessible nival zone, have been exposed to adverse effects associated with mountaineering, high-mountain trekking, rafting and other types of competitive tourism for 50 years [2]. The high popularity of high-altitude tourism causes ecological imbalance by, for example, destruction of vegetation, fauna changes, introduction of new species (plants and animals), pollution with garbage and excrement, littering the natural landscape by tourist infrastructure and noise, etc. [8,21–23]. That is why over a dozen PAs within the Himalayas were introduced.

History and development of PAs of the Himalayas

Nature conservation has a long tradition in Himalayan history [7]. Wise use of natural resources was a prerequisite for many hunter-gatherer societies of the Himalayas, which date back to at least 6000 BC [24]. Extensive clearance of forests accompanied the advance of agricultural and pastoral societies in subsequent millennia, but an awareness of the need for ecological prudence emerged and many so-called pagan nature conservation practices were retained [24] 26]. As more land became settled or cultivated, so these hunting reserves increasingly became refuges for wildlife [7,25]

India is an excellent example of a Himalayan country with a unique richness of biodiversity due to diversity of physiography and climatic conditions. Overall, a significant proportion (about 72.3%) of the Himalayan Mountain system is located within India. It consists of three parts insulated from each other: west, central and eastern (Fig. 1). These parts differ significantly in their environmental characteristics (Section 2) and nature-based tourism development possibilities (Section 3). That is why a PA has been established. As of 2019, the PAs in the Indian Himalayas cover 34.770km², roughly 9% of the total surface area (Table 1).

Many of these reserves were subsequently declared as national parks or sanctuaries, mostly after Independence in 1947. Wildlife, together with forestry, has traditionally been managed under a single administrative organisation within the forest departments of each state or union territory, with the role of central government being mainly advisory. In 1970, the Indian Board for Wildlife drafted a national wildlife policy [26]. This policy identified the cause of wildlife depletion and made specific recommendations for wildlife conservation in the country. The major threats to wildlife species and habitats identified were habitat changes, use of pesticides, lack of legislative support, commercial exploitation, introduction of exotics, poaching, biotic interference, use of crop protection guns, lack of organisation and guidelines for management. The policy recommended that establishment of a central organisation to maintain territorial integrity of wildlife areas and suggested that 4% of total land area be managed as national parks by a central organisation. This led to the enactment of the Wildlife (Protection) Act in 1972, which provides for three categories of PA: national parks, sanctuaries and closed areas. However, levels of protection afforded in each category differ, as do the degrees of restriction on human activities. The adoption of a National Policy for Wildlife Conservation in 1970 and the enactment of the Wildlife (Protection) Act in 1972 led to a significant growth in the PAs network in India.

Nepal is a landlocked country with a total area of 141,181km² where 83% of the land mass is covered with mountain landscapes including Himalayas [27]. Overall, a small proportion (about 20,7%) of the Himalayan Mountain system is located within Nepal. There are four ranges of mountains in Nepal covering Sivalik, Mahabharat, Mid Hill and High Himalayas. Nepal is broadly divided into two regions namely Mountain and Terai Arc landscape [18,27]. The regional range covers multidimensional attraction for tourism (e.g., trekking, hiking, expeditions) such as beautiful landscapes of great snow-capped Himalayan with steep land surface and fragile ecology, high climate with unlimited flora and fauna. In between these ranges are inhabited by a range of different communities' mixture of various castes, ethnicity with rich culture and traditions who have been sustaining the livelihood either from their traditional occupations (e.g., seasonal agriculture, animal husbandry) or from forest resources over centuries [28].

In 1973, The Department of National Parks and National Parks and Wildlife Conservation Act was established in the same year and passed the law. His Majesty's Government of Nepal initiated the act for the conservation of PAs and raised the importance of wildlife species [29]. Due to these diverse features of PAs dispersedly located into different region across Nepal, conservation areas have also been seen as an attractive component of nature-based and mountain tourism [30]. As of 2019, the PAs in Nepal Himalayas cover 27.837km², roughly 25% of the total surface area (Table 1).

In comparison of India and Nepal, Bhutan is a small country located in the Eastern Himalayas. Overall, a very small proportion (about 7%) of the Himalayan Mountain system is located within Bhutan. Like Nepal, Bhutan is also a landlocked country bordered by the Tibet Autonomous Region of China in the north, and in the west by Indian states of Sikkim and Assam, West Bengal and in the east states of Arunachal Pradesh of India. More than 80% of Bhutan's land area is naturally vegetated with almost 50% secured in a PA network [31]. Constitutionally, 60% of the total land area should remain under vegetation/forest [32,33] and only 8% of the land is suitable and for agriculture, which makes most of the Bhutanese population highly dependent upon natural resources [34]. The strong conservation practices, great geographical diversity combined with equally diverse climate conditions contribute to Bhutan's outstanding range of biodiversity and ecosystems. Bhutan conservation management policy is backed by government regulations and policies which are the reason why the government has remained committed to the carbon-neutral country to date [35].

In the 1960s, the country's first flagship conservation national development plan, however, initially, PAs were designated as wildlife sanctuaries, and since the 1980s PAs were converted into national parks to confer with greater levels of conservation [36]. The current PAs act is called the Forest and Nature Conservation Act of Bhutan, 1995, and repeals and replaces the Bhutan Forest Act of 1969. The PAs in Bhutan Himalayas cover 16.401km², roughly 42.7% of the total surface area (Table 1).

Himalayan areas under protection and their diversity

The above-mentioned, as well as a number of other circumstances, were the reason to place (at various times) some parts of Himalayan range (Fig. 2) under protection. These parts differ significantly in their environmental characteristics and nature-based tourism development potential. The PAs in the Himalayas have been divided to national parks and PAs of a different status.

Overall, national parks are given highest level of protection, with no grazing and no private landholding or rights permitted within them. Sanctuaries are given a lower level of protection, and certain activities may be permitted within them for better protection of wildlife or for any other good and sufficient reason. The state government may declare an area closed to the hunting of wild animals for a specified period; other activities are permitted to continue.

As of 2019, the PAs of the Himalayas cover 79.008km², roughly 14.5% of the total surface area (Table 1 and Fig. 3). In terms of the percentage of PAs (on the scale of their entire area), the Bhutanese Himalayas are unrivalled and almost 43% of the country is protected. Arunachal Himalayas have the smallest PA – just almost 5%.

Table 1. Percentage of the total area under protection in the Himalayan regions.

Region	Area [km ²] ¹	National Parks Area ² (No. of NPs)	Other areas under protections ² (No. of areas)	PAs (Total)	Percentage of the total area under protection
Kashmir Himalayas	222,236	3,916 (3)	10,245 (15)	14,161	6.37
Punjab Himalayas	64,017	1,524 (3)	6,123 (30)	7,647	11.95
Kumaun Himalayas	41,762	4,915 (6)	2,675 (7)	7,590	18.17
Nepal Himalayas	113,161	11,816 (12)	16,021 (16)	27,837	24.60
Sikkim Himalayas	7,096	1,784 (1)	399 (7)	2,183	30.76
Darjeeling Himalayas	6,193	318 (3)	207 (4)	524	8.48
Bhutan Himalayas	38,394	12,927 (5)	3,474 (5)	16,401	42.72
Arunachal Himalayas	55,101	483 (1)	2,181 (8)	2,664	4.83
TOTAL HIMALAYAS	547,960	37,683 (34)	41,325 (92)	79,008	14.42

¹⁾ [3]; ²⁾ [10,37]

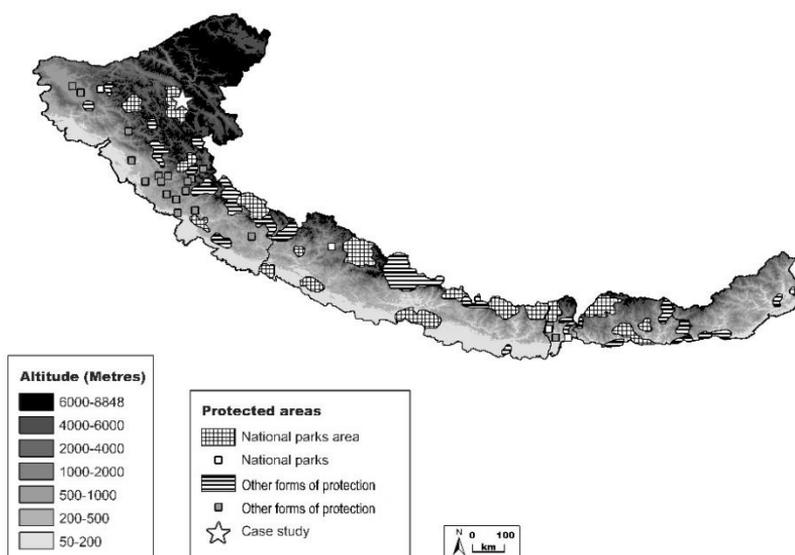


Fig. 3. Himalayan areas under conservation: National Parks; and other PAs, e.g., Wildlife Sanctuaries and Wildlife Reserves.

Overall, due to the low level of economic development in the Himalayan countries, there is currently no possibility of introducing a comprehensive, rational and balanced approach to the natural environment in the region [38]. However, there are ongoing attempts to selectively preserve areas characterised by primary nature and rare flora and fauna, although the PAs created in this way put nature protection on a par with commercial goals.

Spatial and temporal development of protected areas

The process of shaping the system of protected areas in the Himalayas varied in terms of time and space (Fig. 3 and 4, Table 2). One of the oldest national parks is Jim Corbett National Park (Kumaun Himalayas), which was established in 1936. Only after 30 years, the next one, that is Royal Manas National Park was created. Until 1974, changes in the size of protected areas were small, and since the first NP was established (1936), only three more were created. During this period, the area of NP in the Himalayas was 6849.8km². The next twenty years (1975-1994) was characterized by very high dynamics in terms of establishing new protected areas with the NP status. During this period, 23NPs were created, and the area of protection increased by 21,841.54km², a more than three-fold increase. Most of the new NPs (9) were created in 1980-84. In 1995-2019, changes in the number of NPs were already small. The largest change in the area of protected areas (NP) took place in 2008, when the largest national park (Wangchuck Centennial National Park) was established.

Table 2. Spatial and temporal development of PAs in Himalayas.

Period of time	Before 1959	1960-1964	1965-1969	1970-1974	1975-1979	1980-1984	1985-1989
Number of PAs							
NPs	1	0	1	2	5	9	6
Other form of protection	8	10	1	2	7	8	18
Total PAs	9	10	2	4	12	17	24
Total sq. km							
NPs	520.8	0	1057	5272	5053	9982.6	4754.49
Other form of protection	693.7	1411.1	862	1244	568.52	959	11717.54
Total PAs	1214.5	1411.1	1919	6516	5621.52	10941.6	16472.03

Period of time	1990-1994	1995-1999	2000-2004	2005-2009	2010-2014	2015-2019	Total 1936-2020
Number of PAs							
NPs	3	2	1	1	2	1	34
Other form of protection	10	6	6	9	4	3	92
Total PAs	13	8	7	10	6	4	126
Total sq. km							
NPs	2051.45	2635	159	4914	550	637	37,683
Other form of protection	11955.4	6056	949.25	163.28	4356	387.81	41,325
Total PAs	14006.85	8691	1108.25	5077.28	5000	1024.81	79,008

Source: [10,37]

The first areas with a protection regime other than NP were established in 1955. These were mainly reserves and/or sanctuaries. Until 1959, there were 8 such areas in the Himalayas, with a total area of 693.7km², most of which were small. As in the case of NP, we have observed a dynamic increase in the number of new forms of nature protection since 1975. The greatest increase in the number of reserves/sanctuaries took place in the period 1985-94, then their number increased by another 28, and the area by 23,672.94km².

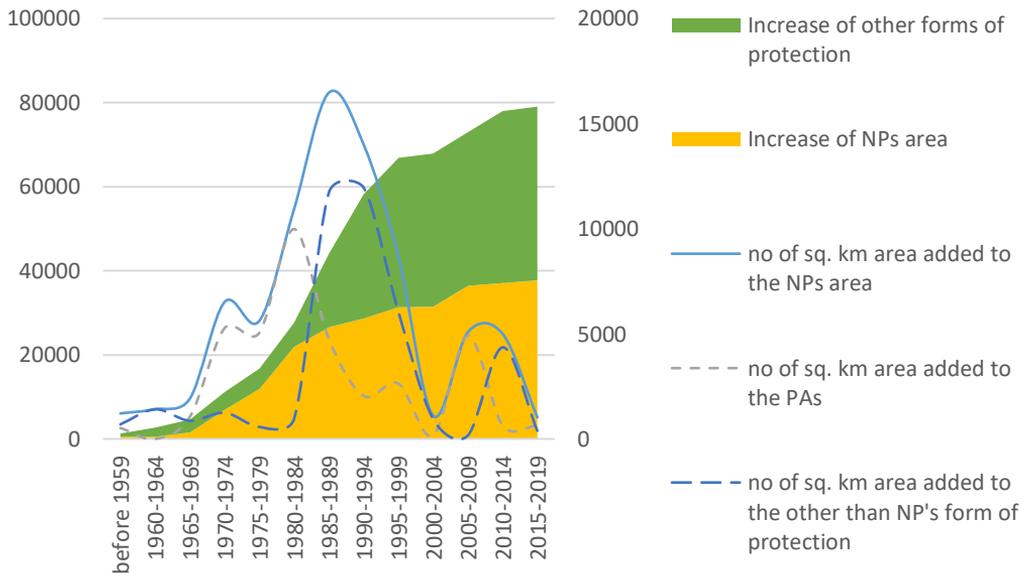


Fig. 4. Spatial and temporal development of PAs in Himalayas.

Concluding, from the first park established in the Himalayas in 1936 the number of parks and their area increased. However, it was not a constant increase. Over the years, one period can be observed when both the number of protected areas and their surface area increased. It reached its peak in the years 1985-1994 a decade during which 30478.88km² was taken under protection, which accounts for almost 39% of the total PAs in the Himalayas. Overall, almost 79% of all PAs, that is 78 PAs, were established in the years 1970-1999, but recent times showed a slower rate of designation.

The Himalayas under tourism pressure

Tourism is one of the most dynamic sectors of the economy. As an instrument of regional policy, it activates local communities and builds solid foundations for economic development. High-mountain tourism is a particularly pro-development activity, which by operating in closed communities significantly influences them [9,12,39–43]. Overall, mountain tourism, which ranks second in popularity, just after the coastal regions [44], is a multifaceted phenomenon [4], which depends on the increase in the economic status of countries and communities living in mountain regions [45].

Since the mid-twentieth century tourism has become the main element shaping and influencing the development of Himalayan regions [46]. Incomplete data indicate that the Himalayan region was visited by over 58.3 million tourists in 2012 alone, nearly a 1.5 million more than a year earlier (Table 3).

Table 3. Number of tourists (domestic and foreign) visiting the Himalayas in 2011 and 2012 and the rate of change.

Himalayas Regions	2011		2012		Rate of change	
	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign
Kashmir Himalaya	13,071,531	71,593	12,427,122	78,802	-4.93	10.07
Punjab Himalaya	15,514,792	521,699	16,570,637	534,414	6.81	2.44
Kumaun Himalaya	25,946,254	124,653	26,827,329	124,555	3.4	-0.08
Nepal Himalaya	NA	736,215	NA	803,092	-	9.08
Sikkim Himalaya	552,453	23,602	558,538	26,489	1.1	12.23
Darjeeling Himalaya	NA	NA	NA	NA	-	-
Bhutan Himalaya	53,223 ¹	36,765	50,722 ¹	54,685	-4.70	48.74
Arunachal Himalaya	233,227	4,753	317,243	5,135	36.02	8.04
TOTAL	55,318,257	1,519,280	56,700,869	1,627,172	2.5	7.10
	56,837,537		58,328,041		2.62	

Source: [47–49], BTM [48] domestic tourists include tourists from India, Bangladesh and Maldives.

The Himalayan regions of Kumaun (26.9 million) and Punjab (17.1 million) received the greatest interest. The structure of tourist traffic in all regions is dominated by domestic (regional) tourists, whose value is systematically increasing. They are, for the most part, pilgrims practicing Buddhist or Hindu religious or cultural rites. Surveys carried out by the Nepalese or Bhutanese government tourism institutions show that around 10% of the total tourists in Himalayan regions visit their high-mountain range [47,48]. On this basis, the number of high-mountain tourists in 2012 was estimated at 58 million, including 56.7 million domestic tourists and 1.62 million foreign tourists. Among domestic tourists, pilgrimage tourism dominates, while foreigners choose adventure tourism, especially high-altitude trekking and, increasingly common, high-altitude climbing [46,50].

Below are the most popular Himalayan areas for mountain hiking, trekking or climbing. The description was made in terms of individual physio-geographical mesoregions (Fig. 1), divided into eight smaller parts corresponding to administrative units [3].

Western Himalayas

Kashmir Himalayas

The Kashmir Himalayas are defined as the part of the Himalayan range in the state of Jammu and Kashmir (Fig. 1). They are inhabited by 12.5 million people [3]. Each year, the region is visited by over 12.5 million people (tourists), among whom domestic tourists dominate (Table 3).

Kashmir's Himalayas owe their extraordinary tourist popularity to the pilgrims of three religions (Hinduism, Buddhism and Islam), who have been joining the area for centuries to create its rich culture. Hiking routes to places of worship are often at high altitudes. Most of them are appropriately equipped in terms of tourist infrastructure, that is in-situ infrastructure and connection links. An excellent example is located at an altitude of 3,888 metres, the Amarnath Temple dedicated to Lord Shiva, which in 2011 was visited by a record number of nearly 635,000 pilgrims [51].

Trekking and mountain climbing are a fraction of the total tourist traffic of the Kashmir Himalayas, although the percentage of those who practice this alpine activity is growing dynamically. The most popular regions include (1) Ladakh and (2) Kashmiri Valley. These diametrically opposed areas account for almost all the tourist traffic in the region.

(1) Ladakh is a land separating the Himalayan range from Karakorum. Due to low rainfall (Leh: 110mm/year [52] from: climate-data.org) and altitude exceeding 3,000m, Ladakh is considered one of the driest regions of the Indian Himalayas [53]. This environmental aspect, as well as the cultural convergence with Buddhist heritage means that many guides define it as Little Tibet [54]. The Himalayan part of Ladakh offers several trekking routes [54,55]. Fans of the Himalayan mountain range will find a range of five- and six-thousander mountains [56,57], as well as two seven-thousander peaks: Nun (7,135m) and Kun (7,077m). The most popular and the most-conquered summit is located just 20km south of the capital of the region (Leh), Stok Kangri (6,121m).

(2) Kashmir Valley – separating Pir Panjal from the Great Himalayas – is surrounded by high peaks, which stop the southwest monsoon providing the region with heavy rainfall (Srinagar: 693mm/year [52]). The charming nature of Kashmir is often referred to as ‘Switzerland, but in Himalayan proportions’ [54]. The main city (as well as the summer capital of Jammu and Kashmir) of the region – Srinagar – offers many attractions. The largest is Dal Lake with residential boats floating on it. The city is an established tourist base, from which trekking groups and climbing expeditions start. Due to the turbulent political situation in the region (including the ongoing India-Pakistan conflict), only the surroundings of the Dachigam National Park located between the Lidder and Sindh valleys [17] are crowded with tourists (including the Amarnath Temple). The tense political situation affects the rarity of issuing climbing permits, although this has eased a little in recent years. For example, in 2011 – after more than two decades – the administration issued permission to enter Cerro Kishtwar [58]. The region has unusually high climbing potential, but due to the Kashmir conflict many peaks remain beyond the reach of mountaineers.

The highest peak of the Kashmir Himalayas and the whole Western Himalayas is Nanga Parbat (8,125m) lying in north-eastern Pakistan. This exceptionally isolated mountain – bordered by the Indus River on the north and west – is rarely visited by climbers and tourists [55].

Punjab Himalayas

The Punjab Himalayas are the western part of the Himalayan chain covering the area of four Indian states, i.e., Himachal Pradesh, Punjab, Chandigarh and Haryana. It is inhabited by over 13 million people [3] and annually visited by over 16 million people (tourists). Domestic tourists dominate (Table 3). The Punjab Himalayas (500,000 foreign tourists) are right behind the Nepalese (800,000) which is the most-visited part of the range by foreign tourists.

The dominant part of the Punjab Himalayas is the state of Himachal Pradesh. It boasts tourist resources in the form of spectacular mountain scenery, hospitable climate, diverse flora and fauna, a varied culture, pilgrimage centres and numerous opportunities for active leisure: climbing, trekking, paragliding, fishing, river rafting, skiing, etc. [59]. In 2011, the most popular destinations for tourists were the districts of Shimla (3.4 million domestic; 127,000 international), Kulu (3.1 million; 120,000) and Kangra (1.5 million; 41,000) [60]. Most domestic tourists declared willingness to rest and recreation as the main reason for their visit (72%), and only 14% indicated pilgrimage [60]. According to a government survey, pilgrims do not dominate the tourist traffic, but numerous temples located in Himachal are crowded. For example, the Brahmaur temple complex, that includes Lake Manimahesh (4,080 m) dedicated to Lord Shiva, is visited by around 700,000 people a year [61].

Himachal caters to all forms of tourism, but apart from hiking (e.g., trails to temples), mountaineering is a fraction of the total market. Most tourists passively spend time in mountain resorts, such as Manali or Shimla, and if they do it actively, they usually do not stray too far away from them (e.g., Manali – Solang Valley). In recent years, interest in trekking and climbing has been growing dynamically in this area, as attested by the increase in the number of trekking and climbing agencies. The most popular mountain regions include the Kullu and Lahaul valleys.

The Kullu Valley, which the inhabitants refer to as the Valley of the Gods is the most visited tourist region of Himachal [62], and the city of Manali is the beginning of virtually every trekking or climbing trip in the state [54]. The Pir Panjal chain flanking the valley from the north maintains the summer monsoon for a long time, providing the region with heavy rainfall (Manali: 1,972mm/year [52]). Heavy rain is useful for agriculture and forestry, but often destroys road infrastructure. Many trekking routes begin from the valley [54,62], and the surrounding 5,000 and 6,000 metre peaks [63] are the target of many mountaineering trips – usually commercial. For a low fee (e.g. Indians USD 55; foreigners USD 200) local agencies organise trips for climbing enthusiasts, among others to Deo Tibba (6,001 m). Domestic tourists often go by car to the Rohtang La pass (3,978m), and then walk for several hours on foot – horse riding is also possible. The Rohtang La pass opens the way to another (natural and cultural) world – the Himalayas Lahaul.

Lahaul is referred to (like Ladakh) Little Tibet or the Yellow Mountains Country [62]. Compared to all lands south of the main ridge of the Pir Panjal chain (including the Kullu Valley), it is a relatively dry area (Keylong: 824mm/year [52]). The temples of Tibetan Buddhist worshippers here, partly absorbed by or shared with Hinduism, are frequently visited by followers of both religions. Multiple trekking routes weave through the valleys that converge on the Chandra Bhaga River (mainly the valleys of Chandra, Miyar and Pangri). They cut into the Lahaul Himalayan chain of the Great Himalayas. A lot of 5,000–6,000 metre peaks have never been summited, and others rank among the most difficult climbing routes in the world, e.g., the Prow of Shiva route to Mount Shiva (6,142m) in the Pangri Valley.

Central Himalayas

Kumaun Himalayas

The Kumaun Himalayas partly overlap with the administrative area of the state of Uttarakhand (formerly Uttaranchal). They are inhabited by six million people [3], and each year is visited by over 26 million people (tourists). Domestic tourists dominate (Table 3).

The region owes its extraordinary tourist popularity to Hindu pilgrims who have been coming to these areas for centuries. Hiking routes to places of worship, although they are often at high altitudes, tend to be well-prepared in terms of tourist infrastructure, e.g. hotels, restaurants. The most visited is located in the Himalayas Garhwal (Great Himalayas) temple complex Chota Char Dham (literally translated as ‘the small four abodes/seats’). It consists of four high mountain temples: Badrinath (3,133m), Kedarnath (3,553m), Gangotri (3,048m) and Yamunotri (3,293m). Each of them is visited annually by hundreds of thousands of faithful, whose number increases dramatically from year to year. For example, the Badrinath Temple in 1975 was visited by only 180,000 pilgrims, while in 2012 their number was close to one million (925,998) [64].

With millions of pilgrims, practicing (adventure) trekking or mountain climbing constitutes a negligible percentage of total tourist traffic. The research of Gupta and Bhatt [65] carried out in the Kumaun Himalayas area showed that up to 82% of respondents consider pilgrimage to be the main reason for the visit. The experience of adventure is declared by only 12% of respondents, although this number is gradually increasing.

The 320km Kumaun Himalayan chain stretching between the Sutlej River and Kali is divided into two smaller units, i.e., Uttarakhand Garhwal in the west and Kumaun, which is stuck to the eastern Nepalese border. For this reason, the Great Himalayas in these areas are called the Garhwal Himalayas and the Kumaun Himalayas (proper ones).

Determined the land of the gods, Garhwal is visited by more pilgrims every year than its tourist carrying capacity [63]. Pilgrimage (hiking) tourism dominates in the region. There are also

many trekking routes with the enchanting Valley of Flowers at the head [54,55,63,66], and the Himalayas Garhwal area is a mountaineers' paradise. Some of the most famous Himalayan peaks are here. For example, referred to as the Himalayan Matterhorn – Shivling (6,543m) or the legendary Nanda Devi (7,816m), as well as dozens of other five-, six- and seven-thousanders.

The Kumaun Himalayas are essentially a continuation of the Garhwal Himalayas, from which they are separated by the Nanda Devi massif. Among many trekking routes [54,67] two are the most popular. Perfectly prepared for tourist infrastructure, the route to the face of the Pindari Glacier, from which flows one of the main rivers later forming the Ganges, and the trail – surrounded by numerous 6,000 metres peaks – lead to the base of Sunanda Devi (formerly Nanda Devi East) (7,434m). Kumaun, like Garhwal, is full of 5,000 and 6,000 metre peaks. Here it is referred to as the Temple of God (Hardeol, 7,154m), which has been conquered only twice to date.

Nepal Himalayas

The Himalayas of Nepal are part of the Himalayan chain lying in the Federal Democratic Republic of Nepal. They are inhabited by 13 million people [3] and are visited by over 800,000 foreign tourists annually. This is a record number compared to other parts of the Himalayas (Table 3). Unfortunately, the Nepalese administration does not keep statistics on domestic traffic. However, analysing the proportions of domestic and foreign tourists in other Himalayan regions it can be assumed that this value will be several times higher. This is confirmed by estimates of the number of pilgrims who visited the Manakamana Temple in 1999; some 500,000 people [68].

Geographically, biologically and culturally rich, Nepal has countless tourist attractions, including the highest mountain on Earth, Mount Everest – called Sagarmatha by the Nepalese – and seven other 8,000 m peaks. Nepal is 75% covered by mountains and hills and attracts tens of thousands of foreign tourists (105,015) annually, for whom the main reason for their visit is trekking and climbing [47]. Based on data from the last half century, the number of foreigners visiting Nepal is increasing by an average of 12.5% per year [12].

Among the most popular Nepalese mountain tourism regions is around the eight-thousanders Annapurna, Dhaulagiri and Manaslu, as well as Mount Everest, Lhotse and Makalu. Located between the Dhaulagiri massif in the west and Manaslu in the east, the Annapurna massif is the most visited mountain area of Nepal. Taking into account all the attractions of this country, it ranks second – in terms of number of tourists – just behind the Chitwan National Park. The Annapurna Circuit itself is considered one of the most beautiful trekking routes in the world. Additionally, through numerous variants, it connects with routes leading to the main bases of Annapurna, Dhaulagiri or Manaslu, and the isolated Buddhist Kingdom of Lo commonly referred to as the Kingdom of Mustang [69]. Mountaineers, in addition to the eight-thousanders mentioned above, will find a number of outstanding and technically difficult 6,000–7,000 metre peaks here, such as Annapurna South (7,219m), as well as several easy trekking peaks (intermediate form between climbing and trekking) like Singu Chuli (6,501m), Huinchuli (6,441m), Thatpu Chuli (5,663m) or Mardi Himal (5,587m). In the Annapurna massif there is also the majestic Pyramid of Machhapuchhare (known as the Matterhorn of Nepal) – a mountain dedicated to Lord Shiva, on which climbing has been banned for religious reasons.

The Mount Everest, Lhotse and Makalu region is perfectly prepared for tourist infrastructure. It is, just after the Annapurna region, the most visited high-mountain part of Nepal. Mount Everest attracts the greatest interest of mountain tourists, especially its main base camps, the departure point for costly expeditions to the summit [4]. Everest is one of the most crowded peaks in the Himalayas, not only in Nepal, but throughout the entire Himalayan range (as many as 408 permits issued in 2012). There are also many lower and more accessible peaks for mountaineers, including the very popular (175 entries in 2012) Mount Ama Dablam (6,856 m). Nearly half (16) of 33 trekking peaks (actually mountain climbing peaks) established by the Nepalese authorities are in the Mount Everest area. The most known and most conquered in 2012 include: Island Peak (6,160m) – 3,003 entries, Mera (6,654m) – 1,487 entries, Lobuche West (6,145m) – 581 entries [47].

*Eastern Himalayas**Sikkim Himalayas*

The Sikkim Himalayas are the part of the Himalayan chain that lies in the Indian state of Sikkim. Slightly over 600,000 people live there [3], and another nearly 600,000 people (tourists) visit annually. Domestic tourists dominate (Table 3).

The region owes a large number of domestic tourists mainly to the pilgrims of two religions (Hinduism and Buddhism), who visit numerous temples located mainly in the southern district (Sikkim South). Indians readily make pilgrimages to the 1,980m altitude Kirateshwar Mahadev temple, while Buddhists usually choose the statue dedicated to Guru Padmasambhava located on the hills of Samdruptse (from Bhutia Hill of Fulfilled Wishes). However, other smaller Hindu temples or Buddhist monasteries can be found much higher.

Trekking and climbing are a fraction of the total tourist traffic of the Sikkim Himalayas. However, an upward trend is noticeable. The most popular trekking area of the third highest mountain in the world – Kangchenjunga (8,589m) [54,55]. Located slightly south of the main Himalayan ridge – Kangchenjunga receives the main force of summer monsoons. This results in significant snowfall and leads to frequent avalanches, for which the mountain is famous. Similar snow characteristics are preserved by the southern 6,000 and 7,000 metre mountains. The region is considered very dangerous for mountaineers.

Darjeeling Himalayas

The Darjeeling Himalayas lie in the northern part of Indian West Bengal (state). With an area of only 6,193km², the area is inhabited by more than 5.7 million people. This makes it the most densely populated (924 people per km²) area of the Himalayas [3].

The Darjeeling region has been famous for its picturesque hill stations since the mid-eighteenth century, which served as bases for the pioneers of mountain hiking [7]. Located at a much lower altitude than the Sikkim Himalayas located in the north, they offer great opportunities for hiking and trekking. One of the best routes runs through the Singalila Mountains separating India from Nepal, in the area of which is the national park (Singalila). From the surrounding peaks, e.g., the highest Sandakphu mountain (3,620m), there is a panorama of the Great Himalayas with Kangchenjunga at the head and Mount Everest in the background.

Bhutan Himalayas

The Himalayas of Bhutan is the part of the Himalayan chain that lies within the Kingdom of Bhutan. The official name of the country is Druk Jul, which in translation means the Kingdom of the Dragon. Inhabited by almost 740,000 people [3] the Himalayas of Bhutan are visited annually by just over 100,000 tourists (Table 3).

By nature, high-altitude tourism in the Himalayan area of Bhutan completely differs from that known in other parts of the Himalayan chain, it is limited only to hiking and trekking. In 1994, the Bhutan authorities introduced a ban on climbing peaks higher than 6,000 metres, and in 2003 extended it to all peaks. Climbing activities are therefore completely prohibited in the country [46]. That is why in Bhutan there are some of the highest so far unexplored peaks. Due to limited accessibility due to cultural aspects, they will probably remain virgin for a long time. These include, for example, the highest terrestrial summit, on which a human foot has not stood – Gangkhar Puensum (7,570m). This limitation results from the great piety of the inhabitants who, in the vast majority (75%) practice Tibetan Buddhism, worship nature, including the highest peaks (the name Gangkhar Puensum means the White Summit of the Three Spiritual Brothers) [70].

Residents and authorities attach the highest importance to environmental protection – as much as 20% of the area is covered by PAs [71,72] (Fig. 2). The price for a restrictive environmental policy is some limitation in the region's accessibility [4]. The minimum daily fee (payment) for staying in Bhutan is USD 250. It includes accommodation, meals and other costs, such as a guide fee [4]. A trekking trip lasts several days, multiplying this amount means that the region, exceeding the financial capabilities of many people, becomes inaccessible to them.

Trekking routes in the Himalayas of Bhutan are usually very physically demanding. They usually run at high altitudes. A perfect example is the 24-day Snowman Trek, which is considered one of the most difficult trekking trips on Earth. The maximum altitude (Rinchen Zoe La –

5,320m) that one has to overcome during trekking is similar to those in other parts of the Himalayan chain. However, the biggest problems are caused not by the maximum and the average altitude of the route oscillating around 4,000 metres [55].

Arunachal Himalayas

The Arunachal Himalayas lie in the easternmost part of the Himalayan chain. They are administratively in the Indian state of Arunachal Pradesh, which has nearly 900,000 inhabitants [3]. Every year, the region is visited by over 320,000 people (tourists), among whom domestic tourists dominate (Table 3).

Arunachal Pradesh is the wildest and the least-known state in India. It is often referred to as the Final Frontier, paraphrasing the nickname of the 49th state (Alaska) of the United States of America (Last Frontier). Every year, the unique culture (26 ethnic groups) and the unspoiled nature of Arunachal is gaining more and more popularity among tourists [73]. The most popular hiking and trekking area is the Tawang Valley sandwiched between Bhutan and China. The temples there (mainly Buddhist) are frequently visited by pilgrims (mainly domestic tourists). Foreign tourists most often head towards the Bailey Trail (named after F.M. Bailey) guaranteeing an environmental and cultural experience. A few alpinists most often climb the relatively easily accessible Gori Chen (6,488m). The region has great potential for mountaineers in the form of the surrounding, still unexplored peaks [74].

The highest peak in the Arunachal Himalayas and the entire Eastern Himalayas is Namche Barwa (7,757m). This exceptionally isolated mountain – from the north, east and south surrounded by the mighty Tsangpo River (Brahmaputra) – is rarely visited by climbers and tourists. Despite many attempts, the summit was not reached until 1992, by a Japanese expedition [75].

Additional information

In this section, we have described the pressure that tourism and its development put on the Himalayan range. As can be noted, in the Himalayas that it was the PAs (i.e. the most attractive for tourists) that became the most vulnerable to the impact of mountain tourism, which here is not only allowed but largely welcome - unlike other forms of economic activity. Anyway, these other forms have little chance of development due to limited environmental resources and environmental restrictions. In this situation, alpine tourism becomes the most important form of impact on the natural environment of the PAs, as well as on the local communities inhabiting them. It also becomes “responsible” for both negative and positive effects of its presence in PAs, as well as for the various problems it causes [8,9,76,77].

The results of the second stage of research will be presented in the next study: Himalayan nature-based tourism: Challenges for tourism and protected areas.

Conclusion

The conclusions for this paper are as follow:

- The Himalayas is a unique natural area: an area with a large area (547,960km²), very diverse in terms of nature and culture (Hindu, Buddhist, Islamic, Animist), a land of natural records (ten of the world’s 14 ‘eight-thousanders’ and 100 summits of over 7,200m), an important natural border of continental (orographic), supra-regional importance, an area of great ecological and economic importance for East and South Asia - due to the supply of irrigation rivers those areas where the natural environment should be particularly protected. For example, Himalayan areas and their resources are important for millions of people, not only those living within their immediate vicinity, but also downstream and further afield.
- A population explosion in the Himalayan range and consequent pressure on natural resources have taken their toll in the whole mountain region, leading to overexploitation of resources. In the fifty-year period from 1961 to 2011, the Himalaya population grew by 250%, from 19 to 53 million and the highest population density, which has approached 1,000 people per square kilometre (923) was recorded in the Darjeeling Himalayas.
- Due to anthropogenic impacts, especially within the lower floors of the mountains (cutting down mountain forests for tea plantations, teak trees, for fuel, etc.), many species of plants

and animals are threatened with extinction. Over three thousand endemic plant species, eight endemic bird species, four mammals and four amphibians are at risk in the Himalayas.

- Nature conservation has a long tradition in Himalayan history, which dates back to at least 6000 BC; currently, in the Himalayas, there are 126 areas under other protection. Overall, the whole range contains over 79,008km² of PAs that account for almost 14.5% of the landmass. The Bhutanese Himalayas has the highest area under protection (43% of the country) while the Arunachal Himalayas has the smallest one – just almost 5%.
- The Himalayas are popular sites for tourism and annually, tens of millions of hikers, trekkers, and climbers converge on these areas; over 58.3 million tourists in 2012 alone. And this number is increasing yearly. The Himalayan regions of Kumaun (26.9 million) and Punjab (17.1 million) received the greatest interest. The structure of tourist traffic in all regions is dominated by domestic (regional) tourists, whose value is systematically increasing.
- Due to the low level of economic development in the Himalayan countries, there is currently no possibility of realizing a comprehensive, rational and balanced approach to nature protection and tourism in the region. There are ongoing attempts to selectively preserve areas characterised by primary nature and rare flora and fauna, and balance pro-poor development objectives with conservation goals. Unfortunately, this process was slow down in recent time. Almost 79% of all PAs, that is 78 PAs, were established in the years 1970-1999.
- To discover the main forms and factors for the strengthening of the tourism competitiveness by implementing economic, social and environmental targets of tourism destination territories development a second part of the paper will be published.

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References

- [1] W. Andrejczuk, *Himalaje: szkic fizyczno-geograficzny - biota, piętra roślinne i krajobrazy*, **Acta Geographica Silesiana**, **24**, 2016, pp. 29–49.
- [2] W. Andrejczuk, *Himalaje: szkic fizyczno-geograficzny - przyroda nieożywiona*, **Acta Geographica Silesiana**, **24**, 2016, pp. 5–28.
- [3] M. Apollo, *The population of Himalayan regions – by the numbers: Past, present and future*, (Chapter 9), **Contemporary Studies in Environment and Tourism**, (Editors: Recep Efe and Munir Ozturk), Cambridge Scholars Publishing, 2017, pp. 145–160.
- [4] M. Apollo, *The true accessibility of mountaineering: The case of the High Himalaya*, **Journal of Outdoor Recreation and Tourism**, **17**, 2017, pp. 29–43. <https://doi.org/10.1016/j.jort.2016.12.001>.
- [5] D. Huddart, T. Stott, *Adventure tourism: environmental impacts and management*, **Springer Nature, Tourism Recreation Research**, **46**(1), 2021. <https://doi.org/10.1080/02508281.2020.1782694>.
- [6] J.D. Ives, *Himalayan perceptions: Environmental change and the well-being of mountain peoples*, **Himalayan Journal of Sciences**, **2**(3), 2004, pp. 17–19. <https://doi.org/10.3126/hjs.v2i3.224>.
- [7] D. Zurick, J. Pacheco, **Illustrated Atlas of the Himalaya**, The University Press of Kentucky, Lexington, 2006. <https://doi.org/10.5860/choice.44-3059>.
- [8] M. Apollo, V. Andreychouk, *Mountaineering and the natural environment in developing countries: An insight to a comprehensive approach*, **International Journal of Environmental Studies**, **77**(6), 2020, pp. 942-953.
- [9] M. Apollo, V. Andreychouk, P. Moolio, Y. Wengel, U. Myga-Piątek, *Does the altitude of*

- habitat influence residents' attitudes to guests? A new dimension in the residents' attitudes to tourism*, **Journal of Outdoor Recreation and Tourism**, **31**, 2020, Article Number: 100312. <https://doi.org/10.1016/j.jort.2020.100312>.
- [10] P. Spiridon, I. Sandu, *Conservation of cultural heritage: from participation to collaboration*, **ENCATC Journal of Cultural Management and Policy**, **5**(1), 2015, pp. 43-52.
- [11] P. Spiridon, A. Ursu, I. Sandu, *Touristic Revaluation of the Cultural Heritage in the Moldavian Plain*, Conference: 16th International Multidisciplinary Scientific Geoconference (SGEM 2016), Location: Albena, Bulgaria, Date: JUN 30-JUL 06, 2016, **Nano, Bio and Green - Technologies for a Sustainable Future Conference Proceedings**, SGEM 2016, Vol. II, Book Series: International Multidisciplinary Scientific GeoConference-SGEM, 2016, pp. 381-388.
- [12] * * *, **Protected Planet**, Cambridge, UK: UNEP-WCMC and IUCN, www.protectedplanet.net.
- [13] K.M. Pradhan, **Tourism Planning in Nepal: A Case Study of Nagarkot**, The University of Hong Kong, 1996. https://doi.org/10.5353/th_b3125923.
- [14] M. Apollo, *The clash—social, environmental and economical changes in tourism destination areas caused by tourism the case of Himalayan villages (India and Nepal)*, **Current Issues of Tourism Research**, **5**, 2016, pp. 6–19.
- [15] A. Yin, T.M. Harrison, *Geologic evolution of the Himalayan-Tibetan orogen*, **Annual Review of Earth and Planetary Sciences**, **28**, 2000, pp. 211–280. <https://doi.org/10.1146/annurev.earth.28.1.211>.
- [16] R.G. Barry, **Mountain Weather and climate**, Cambridge University Press, Cambridge, UK, 2008. <https://doi.org/10.1080/10889370902948894>.
- [17] E. Shukurov, *The natural environment of Central and South Asia, History Civilization Central and South Asia Toward, Contemporan Period from Mid Ninet to End Twent Century*, 2005, pp. 493–528.
- [18] A.T.A. Learmonth, R.L. Singh, **India: A Regional Geography**, National Geographical Society of India, Delhi, 1971. <https://doi.org/10.2307/1797459>.
- [19] S.S. Negi, **Himalayan Wildlife, Habitat and Conservation**, Indus Publishing, 1992. <https://books.google.co.in/books?id=W88pkms1dXEC>.
- [20] * * *, *The Eastern Himalayas: Where Worlds Collide - New Species Discoveries*, **WWF Report**, 2009. www.wwf.se.
- [21] * * *, **Conservation International Raport**, 2012. <https://www.conservation.org/>.
- [22] S.S. Negi, **Himalayan Forests and Forestry**, Indus Publishing Company, New Delhi, 2000.
- [23] A. Barros, C.M. Pickering, *Impacts of experimental trampling by hikers and pack animals on a high-altitude alpine sedge meadow in the Andes*, **Plant Ecology and Diversity**, **8**, 2015, pp. 265–276. <https://doi.org/10.1080/17550874.2014.893592>.
- [24] M. Apollo, V. Andreychouk, *Trampling Intensity and Vegetation Response and Recovery according to Altitude: An Experimental Study from the Himalayan Miyar Valley*, **Resources**, **9**(8), 2020, Article Number: 98. <https://doi.org/10.3390/resources9080098>.
- [25] A. Kothari, P. Pande, S. Singh, D. Variava, **Management of National Parks and Sanctuaries in India. A Status Report**, Environmen, Indian Institute of Public Administration: New Delhi, India, New Delhi, India, 1989. [https://doi.org/10.1016/0006-3207\(90\)90091-3](https://doi.org/10.1016/0006-3207(90)90091-3).
- [26] M. Mandal, *Protected Area Management in India: A Perspective*, **XII World Forestry Congress**, Quebec, Canada, Sept. 21-28, 2003.
- [27] C.S. Negi, S. Nautiya, *Indigenous peoples, biological diversity and protected area management — policy framework towards resolving conflicts*, **International Journal of Sustainable Development and World Ecology**, **10**, 2003, pp. 169–179. <https://doi.org/10.1080/13504500309469795>.
- [28] * * *, **Statistical Pocket Book Nepal**, Central Bureau of Statistics (CBS), 2006.
- [29] P.K. Upadhayaya, **Contribution of International Organizations/Agencies in the**

- Development of Tourism Nepal**, Purbanchal University, Kathmandu, Nepal, 2006.
- [30] * * *, **World Database on Protected Areas (WDPA)**, IUCN, 2009.
- [31] D. Khadka, S.K. Nepal, *Local responses to participatory conservation in Annapurna Conservation Area, Nepal*, **Environmental Management**, **45**, 2010, pp. 351–362. <https://doi.org/10.1007/s00267-009-9405-6>.
- [32] R. Rajaratnam, K. Vernes, T. Sangay, *A review of livestock predation by large carnivores in the Himalayan kingdom of Bhutan* (Chapter), **Problematic Wildlife a Cross-Disciplinary Approach** (Editor: Francesco M Angelici), 2015, pp. 143–171. https://doi.org/10.1007/978-3-319-22246-2_8.
- [33] * * *, **The Constitution of Bhutan**, R.G. of Bhutan, 2008.
- [34] D. Bruggeman, P. Meyfroidt, E.F. Lambin, *Forest cover changes in Bhutan: Revisiting the forest transition*, **Applied Geography**, **67**, 2016, pp. 49–66. <https://doi.org/10.1016/j.apgeog.2015.11.019>.
- [35] * * *, **LUPP Dzongkhag Data Sheets for Bhutan**, L.U.P. PROJECT, 1995,.
- [36] C. Mellino, **This Country Isn't Just Carbon Neutral, Its Carbon Negative**, Climate, 2016.
- [37] * * *, **National Biodiversity Strategies and Action Plan of Bhutan**, Ministry Of Agriculture And Forests, 2014.
- [38] J. Sachs, **The Age of Sustainable Development**, Columbia University Press, New York, USA, 2015.
- [38] S.K. Nepal, **Tourism in protected areas: The Nepalese Himalaya**, Himal Books, Lalitpur, 2003. [https://doi.org/10.1016/s0160-7383\(99\)00105-x](https://doi.org/10.1016/s0160-7383(99)00105-x).
- [40] S.K. Nepal, *Tourism and the environment Perspectives from the Nepal Himalaya*, **Annals of Tourism Research**, **27**, 2000, pp. 661–681.
- [41] S.K. Nepal, *Tourism-induced rural energy consumption in the Annapurna region of Nepal*, **Tourism Management**, **29**, 2008, pp. 89–100. <https://doi.org/10.1016/j.tourman.2007.03.024>.
- [42] K.C. Birendra, R. Paudyal, S.S. Neupane, *Residents' perspectives of a newly developed ecotourism project: an assessment of effectiveness through the lens of an importance–performance analysis*, **Asia Pacific Journal of Tourism Research**, **23**, 2018, pp. 560–572. <https://doi.org/10.1080/10941665.2018.1467938>.
- [43] M. Apollo, R. Rettinger, *Mountaineering in Cuba: improvement of true accessibility as an opportunity for regional development of communities outside the tourism enclaves*, **Current Issues in Tourism**, **22**, 2019, pp. 1797–1804. <https://doi.org/10.1080/13683500.2018.1446920>.
- [44] Z. Mieczkowski, **Environmental Issues of Tourism and Recreation**, University Press of America, Lanham, 1995.
- [45] B. Messerli, J.D. Ives, **Mountains of the World: A Global Priority**, Parthenon Publishing, New York and Carnforth, 1997. <https://doi.org/10.1139/a02-006>.
- [46] R.C. Bisht, **International Encyclopaedia of Himalayas (5 Vols. Set)**, Vedams eBooks (P) Ltd., New Delhi, India, 2008.
- [47] * * *, **Nepal Tourism Statistic (NTS)**, 2012. www.tourism.gov.np.
- [48] * * *, **Bhutan Tourism Monitor (BTM)**, 2012. www.tourism.gov.bt.
- [49] * * *, **India Tourism Statistics (ITS)**, 2012. www.tourism.gov.in.
- [50] M. Apollo, *Mountaineer's Waste: Past, Present and Future*, **Annals of Valahia University of Targoviste**, Geographical Series, **16**, 2016, pp. 13–32. <https://doi.org/10.1515/avutgs-2016-0002>.
- [51] * * *, **Record Rush of Pilgrims to Amarnath** PTI, 2011. www.thehindu.com.
- [52] * * *, **Climate Data**, 2020. www.climate-data.org.
- [53] J. Rizvi, Ladakh, **Crossroads of High Asia**, Oxford University Press, Oxford, UK, 1996. <https://doi.org/10.2307/3673241>.
- [54] G. Weare, **Trekking in the Indian Himalaya**, Lonely Planet Publications Pty Ltd. Singapore, 2009.
- [55] K. Reynolds, **Trekking in the Himalaya**, Cicerone Press Ltd., Milnthorpe, UK, 2013.

- [56] M.S. Kohli, **Mountaineering in India**, Vikas Publishing House, Delhi, India, 1989.
- [57] M.S. Kohli, **The Himalayas: Playground of the Gods-Trekking, Climbing and Adventures**, Indus Publishing, New Delhi, India, Indus : New Delhi, India, 1983.
- [58] L. Griffin, *Kishtwar Gold. Mountain Word, Climb Magazine*, 2012, pp. 50–52.
- [59] M. Jreat, **Tourism in Himachal Pradesh**, Indus Publishing, New Delhi, India, 2004.
- [60] * * *, **Tourism Survey for the State of Himachal Pradesh**, TSHP, 2012. www.tourism.gov.in.
- [61] H. Pradesh, B. Bear, W.B. Eagle, A. Secretary, *The Green Hiker attitude slowly picks up at Manimahesh*, **Himalayan Highlights**, 2010, pp. 2–4.
- [62] M. Sethi, S. Bhargava, M. Liddle, **Himachal**, Harper Collins Publishers, New Delhi, 2003.
- [63] H. Kapadia, **Across Peaks & Passes in Garhwal Himalaya**, Indus Publishing, New Delhi, India, 1999.
- [64] * * *, **Shri Badarinath - Shri Kedarnath Temples Committee, Pilgrims Statistics**, BKTC, 2016. www.badarikedar.org.
- [65] S.K. Gupta, V.P. Bhatt, *Changing expectations of traditional pilgrims. An Analysis of Expectations and Motivations of Tourists Visiting Badri-Kedar Tourism Zone*, **Sustainable Responsible Tourism Trends**, Pract. Cases, Delhi, India, 2012, pp. 54–65.
- [66] H. Bisht, **Tourism in Garhwal Himalaya: With Special Reference to Mountaineering and Trekking in Uttarkashi and Chamoli Districts**, Indus Publishing, New Delhi, India, 1994.
- [67] K.P. Sharma, **Garhwal & Kumaon: A Guide for Trekkers and Tourists**, Cicerone Press Ltd: Milnthorpe, USA, 1998.
- [68] T. Bieie, *Pilgrim tourism in the Central Himalayas: The case of Manakamana Temple in Gorkha, Nepal*, **Mountain Research and Development**, **23**, 2003, pp. 177–184. [https://doi.org/10.1659/0276-4741\(2003\)023\[0177:ptitch\]2.0.co;2](https://doi.org/10.1659/0276-4741(2003)023[0177:ptitch]2.0.co;2).
- [69] M. Mayhew, J. Bindloss, **Trekking in the Nepal Himalaya**, Lonely Planet Publications Pty Ltd, Singapore, 2009.
- [70] S.K. Berry, *Kingdom of the Thunder Dragon*, **The Himalayan Journal**, **44**, 1988, Article Number: 7.
- [71] K. Tshering, J. Bauer, **Evaluation of integrated and development programs (ICDPs) in protected areas of Bhutan**, *Conservation a Crowded World Case Study from Asia-Pacific*, 2012, pp. 55–76.
- [72] H. Karst, *“This is a holy place of Ama Jomo”: buen vivir, indigenous voices and ecotourism development in a protected area of Bhutan*, **Journal of Sustainable Tourism**, **25**, 2017, pp. 746–762. <https://doi.org/10.1080/09669582.2016.1236802>.
- [73] K. Megu, *Prospects of coultural tourism in Arunachal Pradesh*, **Industrialisation in North-Eastern Region** (Editor: J. U. Ahmed), 2007, pp. 61–72.
- [74] T. Nakamura, *South Tibet Borderlands - Shannan - Autumn 2013. Only one day ‘blue sky’ expedition & less-frequented region*, **Japanese Alpine News**, **15**, 2014, pp. 84–97.
- [75] T. Shigehiro, *Namche Barwa*, **American Alpine Journal**, **67**, 1993, pp. 279–281.
- [76] M. Apollo, V. Andreychouk, J. Mostowska, K. Rawat, *Indo-Himalayan Protected Areas: Peak-Hunters, Pilgrims and Mountain Tourism*, **Nature-Based Tourism in Asia’s Mountainous Protected Areas, Geographies of Tourism and Global Change**, (Editors: T.E. Jones, H.T. Bui), Springer, Cham., 2021, pp. 223-243. https://doi.org/10.1007/978-3-030-76833-1_11.
- [77] H. Bui, T.J. Jones, M. Apollo (editors), *Reflections for Trans-Regional Mountain Tourism, Nature-Based Tourism in Asia’s Mountainous Protected Areas, Geographies of Tourism and Global Change*, Springer International Publishing, 2021, pp. 293-316. <https://doi.org/10.1007/978-3-030-76833>.

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